ORIGINAL RESEARCH PAPER

Pathology

HISTOMORPHOLOGICAL STUDY OF MUCORMYCOSIS IN COVID-19 PATIENTS WITH SPECIAL REFERENCE TO RHINO-ORBITAL REGION IN A TERTIARY CARE CENTER.

KEY WORDS: Mucormycosis, rhino-orbital, covid-19.

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ABSTRACT

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in December 2019 in Wuhan city, Hubei province, China. The patients with comorbid conditions like diabetes mellitus, lung disease are prone to a wide range of viral, bacterial and fungal infections.

Aims And Objectives

1. To know the frequency of mucormycosis in Covid-19 patients.
2. To describe histomorphological pattern of mucormycosis and other fungal infections in Covid-19 patients.

Materials And Methods: A prospective study was conducted from May 2021 to August 2021 for four month period with a sample size of 57 at a tertiary care hospital in south India. All the patients who were diagnosed with and or recovered from COVID-19 infection and came back with the fungal infection symptoms were subjected to surgical debridement were included in the study. All the demographic and clinical data were obtained from requests. **Results:** In the present study we got 57 cases of covid-19 patient with suspected fungal infections. We examined the biopsy taken from different sites of rhinoorbital area with H&E and GMS stain. Out of 57 cases 36 cases were found to be having mucormycosis. **Conclusion:** Since Covid-19 is a risk for many opportunistic infections, its association with invasive fungal infection is dangerous and must be given serious consideration.

INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in December 2019 in Wuhan city, Hubei province, China. It was a Third and largest viral outbreak since new millennium after SARS in 2002 and Middle East respiratory syndrome (MERS) in 2012. Over 3 million people have been infected and the COVID-19 has caused more than two lakh deaths[1].

The patients with co-morbid conditions like diabetes mellitus, lung disease are prone to a wide range of viral, bacterial and fungal infections or may develop nosocomial infections such as ventilator-associated pneumonia[2].

Fungal co-infections is observed in survivors and patients of COVID-19 like species of Candida, Aspergillus and Mucorales. India has a high prevalence rate of type 2 diabetes mellitus, which is a well-known risk factor[3,4,5].

AIMS AND OBJECTIVES

To know the frequency of various mucormycosis in Covid-19 patients.

To describe histomorphological pattern of mucormycosis and other fungal infections in Covid-19 patients.

MATERIALS AND METHODS

A prospective study was conducted from May 2021 to August 2021 for four month period with a sample size of 57 at a tertiary care hospital in south India.

All the patients who were diagnosed with and or recovered from COVID-19 infection and came back with the fungal infection symptoms were subjected to surgical debridement were included in the study.

Varied specimens of nasal, paranasal, orbital tissues, other sites from head and neck region including exenteration specimens, total/subtotal facial bones and soft tissues were included in the study.

All the samples received in histopathology were labelled and kept for fixation in 10% buffered formalin for 24 hours with universal precautions and processed for tissue processing.

Stain: Routine Haematoxylin and Eosin(H & E).

Special stains: Periodic Acid Schiff(PAS) and Grocott-methanamine silver(GMS).

All the demographic and clinical data were obtained from requests.

RESULTS

In the present study we got 57 cases of covid-19 patients with suspected fungal infections. We examined the biopsy taken from different sites of rhino-orbital area with H & E and GMS stain.

Out of 57 cases 36 cases were found to be having mucormycosis.

Out of 36 , 27 cases were male and 09 cases were female. The age of the patients ranged from 29 to 71 years with preponderance in the age group of 45-55 years.

Angioinvasion was seen in one case, perineural invasion in five cases, periorbital invasion in five cases, and bony involvement in two cases.

Most common site involved was ethmoid, followed by wall of

maxilla.

TABLE – 1 Percentage of Mucormycosis and other fungal infections involved.

Fungal infections	Percentage
Mucormycosis	63.15
Candida	07
Aspergillosis	1.75
Candida+Mucor	1.75
Bacterial colonies	5.2
Negative for fungal organisms	21.15

Morphology

Mucormycosis- Broad, aseptate/pauci-septate, ribbon-like hyphae, branching at right angle invading blood vessels and bony trabeculae.

Candida-Both budding and pseudohyphae with necrosis and mixed inflammation.

Aspergillus-molds will appear as acute angle branching septate hyphae .

On microscopy, these organisms are seen in areas of suppurative tissue necrosis with dense mixed inflammatory cell infiltrate predominantly composed of neutrophils, formation of giant cells and epithelioid granulomas.

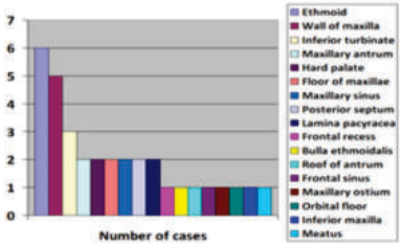

Fig-6: Graph showing various sites involved.

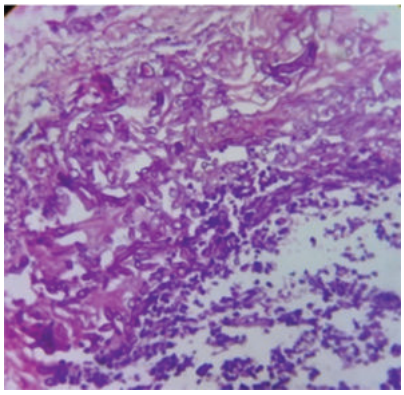

Fig-1: Photomicrograph showing fungal hyphae (H&E stained 40x)

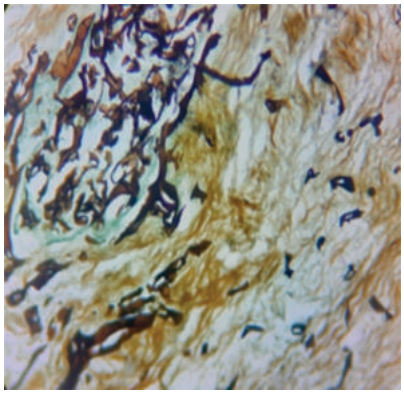

Fig-2: Photomicrograph showing fungal hyphae (GMS stained 40x)

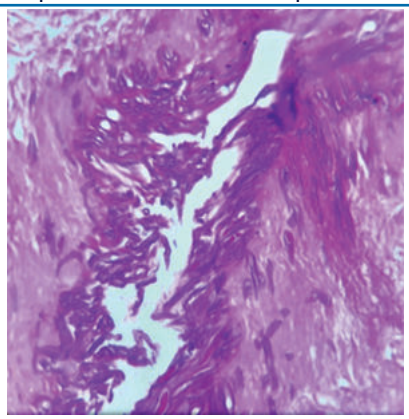

Fig-3: Photomicrograph showing Angioinvasion. (H&E stained 40x)

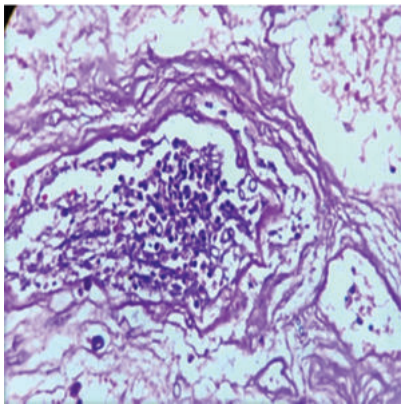

Fig-4: Photomicrograph showing neural invasion. (H&E stained 40x)

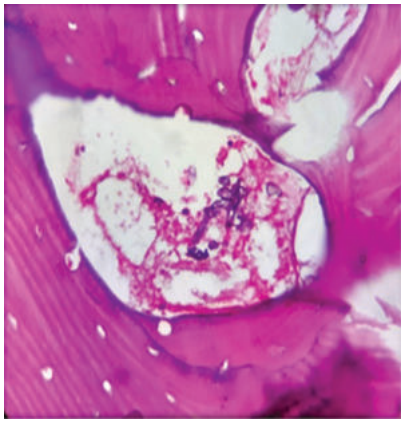

Fig-5: Photomicrograph showing bony invasion. (H&E stained 40x)

Fig-6: Picture showing exenteration specimen.

Fig-7: Picture showing rhino-orbital involvement.

DISCUSSION

Sen et al.(2021) conducted a retrospective, interventional study on 6 COVID-19 patients who developed rhino-orbital mucormycosis and were managed at a tertiary ophthalmic center in India between August 1 and December 15, 2020.[5]

The researchers reported mean duration of 15.6+/-9.6 days between diagnosis of COVID-19 and development of symptoms of mucor[6].

Sharma et al.(2021) study showed 16 cases of mucormycosis, 1 of aspergillosis and 1 case of mixed fungal infection. 6 of these patients died, 11 survived and 1 was lost to follow up.

In a recent review, 8 % of coronavirus-positive/ recovered patients had secondary bacterial/ fungal infections during hospital admission, with widespread use of broad-spectrum antibiotics and steroids[7].

Researchers confirmed significantly higher incidence of fungal infections amongst diabetic patients and suspect strong association with immunosuppression related to corticosteroid administration[8].

Mucormycosis: Mucormycosis/ Zygomycosis (Phycomycosis), initially described in 1885 by Paltauf, is an uncommon and aggressive fungal infection that usually affects patients with alteration of their immunological system. Its associated with invasion of blood vessels, which results in ischemic necrosis.

It has potential to invade various systems in the body resulting in a myriad of clinical symptoms that progress rapidly. Based on anatomic site involved, mucormycosis can be classified into following forms: rhino-cerebral, pulmonary, gastrointestinal, cutaneous, and disseminated.

Aspergillus: Develops from mycelia in areas of high oxygen tension. It spreads through inhalation of airborne conida, it is a Saprophytic fungi in genus Aspergillus. Can be isolated from soil, household, hospital environment, food.

Candida: It is found in normal human skin and mucosal flora. They are typically commensal fungal species; however, if certain conditions are met, they can become invasive. Direct microscopy using potassium hydroxide (KOH) wet mount enhances the visualization of the fungus.

However fungal cultures help to identify the genus, species and antifungal susceptibility testing. Molecular methods like internal transcribed spacers (ITS) sequencing have emerged as useful tools for systematic analysis at the species level and within species as well[9]. They are recommended as first-line method for species identification in Mucorales.

CONCLUSION

Since Covid-19 is a risk for many opportunistic infections, its association with invasive fungal infection is dangerous and must be given serious consideration.

Histopathology is the gold standard for diagnosis of fungal organisms and clinico-pathological correlation will help us to efficiently treat the patients. Since, these invasive fungal infections can be lethal, early detection of fungal infections both clinically and histopathologically is essential for better management.

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